Patent Claims:

1. Antenna arrangement having the following features:

- at least two antenna element systems (3.1, 3.2) are provided and each have at least one antenna element (13; 13.1, 13.2), which are arranged offset with respect to one another, at least in the horizontal direction,
- the at least two antenna element systems (3.1, 3.2) transmit and receive at least in one common polarization plane,
- a network (17) is provided, via which the at least two antenna element systems (3.1, 3.2) can be supplied with a signal (A_{in1}, A_{in2}) with an intensity or amplitude which can be set differently or which can be adjusted relative to one another and preferably with a different phase angle,

characterized by the following further features:

- the network (17) has a phase shifter or phase adjusting device (21, 121), via which an input signal (P_{sin}) which is supplied can be split into two output signals (PS_{out1}; PS_{out2}) with the same intensity as one another but with a different phase angle to one another, and in that, furthermore, a hybrid circuit (19, 119) is also provided, via which the output signals (PS_{out1}, PS_{out2}) can be converted to hybrid output signals (H_{out1}, H_{out2}) which are at a relatively fixed predetermined phase angle with respect to one another and whose amplitudes differ from one another as a function of the different phase angles in the phase adjusting device (21, 121).

2. Antenna arrangement having the following features:

- at least two antenna element systems (3.1, 3.2) are provided and each has at least one antenna element (13; 13.1, 13.2), which are arranged offset with respect to one another, at least in the horizontal direction,
- the at least two antenna element systems (3.1, 3.2) transmit and receive at least in one common polarization plane,
- a network (17) is provided, via which the at least two antenna element systems (3.1, 3.2) can be supplied with a signal (A_{in1}, A_{in2}) with an intensity or amplitude which can be set differently or which can be adjusted relative to one another and preferably with a different phase angle,

characterized by the following further features:

- the at least one network (17) is designed such that a different beam shape is produced for receiving signals than for transmitting signals.

3. Antenna arrangement according to Claim 1 or 2, **characterized in that** the hybrid output signals (H_{out1}, H_{out2}) have the same phase angle or are phase-shifted through 180°.

4. Antenna arrangement according to one of Claims 1 to 3, **characterized in that** an additional phase adjusting element (31), which varies the phase angle, is provided between at least one output (19'a) of the hybrid circuit (19) and at least one input (I) of the antenna system (3).

5. Antenna arrangement according to one of Claims 1 to 4, **characterized in that** the phase adjusting element (21) comprises a differential phase shifter (21').

6. Antenna arrangement according to one of Claims 1 to 5, **characterized in that** the at least two antenna

systems (3.1, 3.2) have antenna elements (13.1, 13.2) which are arranged with a horizontal lateral offset with respect to one another.

7. Antenna arrangement according to Claim 6, **characterized in that** at least two antenna columns (5.1, 5.2) are provided, with the antenna elements (13.1) of one antenna system (3.1) being provided in one column, and the antenna elements (13.2) of the further antenna system (3.2) being provided in the other column (5.2).

8. Antenna arrangement according to one of Claims 1 to 7, **characterized in that** the hybrid circuit (19) is formed from a 90° hybrid (19').

9. Antenna arrangement according to one of Claims 1 to 7, **characterized in that** at least four hybrid circuits (19) are provided and are combined to form a Butler matrix (119), via which a four-column antenna array can be fed, in which an input signal (Ps_{in}) which can be supplied to the input of the phase shifter adjusting device (21) can be split into two phase output signals (PS_{out1}, PS_{out2}) and in that each output (21', 21'') of the phase adjusting device (21) is connected to two inputs (A, B, C, D) of the Butler matrix (119) via a respective downstream branching or addition point (35', 35'').

10. Antenna arrangement according to one of Claims 1 to 8, **characterized in that** at least four hybrid circuits (19) are provided and are combined to form a Butler matrix (119), via which a four-column antenna array can be fed, with a double or multiple phase shifter arrangement being provided, such that the input signal (PS_{in}) which can be supplied to the input (23) of the network (17) and hence to the phase shifter adjusting device (121) can be divided into four phase

shifter output signals, which can be supplied to the four inputs (A, B, C, D) of the Butler matrix (119).

11. Antenna arrangement according to one of Claims 1 to 10, **characterized in that** the antenna elements (3.1) which are arranged in one column (5) are adjusted such that their main lobes are aligned parallel to one another, and in that antenna elements (3.1) which are provided and may be offset with respect to one another in the horizontal direction are adjusted such that their main lobes are arranged such that they run parallel or run such that they are not parallel.

12. Antenna arrangement according to one of Claims 1 to 11, **characterized in that** the antenna elements (3.1, 3.2) are preferably also arranged in front of a common reflector arrangement (1).

13. Antenna arrangement according to one of Claims 1 to 12, **characterized in that** the antenna arrangement has antenna elements (3.1, 3.2) which transmit and receive in one polarization.

14. Antenna arrangement according to one of Claims 1 to 12, **characterized in that** two or more antenna elements (3.1, 3.2) are provided and transmit and receive partially in one polarization and partially in a second polarization plane, which is at right angles to the first polarization.

15. Antenna arrangement according to one of Claims 1 to 14, **characterized in that** the dual-polarized antenna elements are aligned at +45° and -45° to the horizontal.

16. Antenna arrangement according to one of Claims 1 to 15, **characterized in that** antenna elements (3.1, 3.2) are provided which transmit and receive in only one frequency band.

17. Antenna arrangement according to one of Claims 1 to 15, **characterized in that** two or more antenna elements (3.1, 3.2) are provided which transmit and receive in at least two frequency bands, preferably in at least two polarization planes.

18. Antenna arrangement according to one of Claims 1 to 17, **characterized in that** the connecting lines between the outputs (I, II, III, IV) of the hybrid circuit (119) and the inputs (13.1, 13.2, 13.3, 13.4) of the antenna arrangement can be interchanged in order to produce different horizontal polar diagrams.

19. Antenna arrangement according to one of Claims 1 to 18, **characterized in that** the connecting line between the outputs (I, II, III, IV) of the network (119) is preferably in the form of a hybrid circuit and at least some of the inputs (13.1, 13.2, 13.3, 13.4) of the antenna arrangement are of different lengths.

20. Antenna arrangement according to one of Claims 1 to 19, **characterized in that** the network (17) has a receiving path and a transmitting path with at least one receiving network (43) and one transmitting network (45), via which different horizontal polar diagrams can be produced for transmitting and receiving.

21. Antenna arrangement according to Claim 20, **characterized in that** a receiving amplifier (48) and a transmitting amplifier (46), respectively, are provided in the receiving path and/or in the transmitting path.

22. Antenna arrangement according to one of Claims 1 to 21, **characterized in that** the beam shape can be adjusted variably.

23. Method for operating an antenna arrangement in particular according to one of Claims 1 to 22, **characterized by** the following features:

- an input signal can be varied via a phase adjusting device or a phase shifter adjusting device (21, 121) and a downstream network (17) such that the signal at the output of the network (17) and thus at the at least two inputs (3.1, 3.2) is in phase or is not in phase, preferably with a 180° phase shift, such that this makes it possible to produce horizontal polar diagrams, specifically
- (a) which are asymmetric, and/or
- (b) which are symmetrical and have at least two main lobes which are preferably symmetrical with respect to a vertical plane at right angles to the reflector plane, and/or
- (c) which have at least three main lobes or an odd number of main lobes, whose maximum intensities differ from one another by less than 50%.

24. Method for operating an antenna arrangement in particular according to one of Claims 1 to 23, **characterized by** the following features:

- an antenna arrangement is used which has at least two antenna element systems (3.1, 3.2), which each have at least one antenna element (13.1, 13,2),
- the at least two antenna element systems (3.1, 3.2) transmit and receive in at least one common polarization plane, and
- a different beam shape or a different horizontal polar diagram can be produced for receiving signals and for transmitting signals, by means of a network which is provided.

25. Method according to Claim 24, **characterized in that,** during transmission, a horizontal polar diagram is produced which overlaps the horizontal polar diagram

which is produced for reception, with the horizontal polar diagram which is produced for transmission having a surface area with a lower power density.

26. Method according to one of Claims 23 to 25, **characterized in that** a network (17) is used which has a receiving network (43) and a transmitting network (45), via which a horizontal polar diagram can be set which is different for transmission and reception.

27. Method according to one of Claims 23 to 26, **characterized in that** the signal which is supplied to the antenna is subjected to an additional phase shift, at least upstream of one input (13.1 to 13.4).

28. Method according to one of Claims 23 to 27, **characterized in that** at least four hybrid circuits (19) are used, via which a four-column antenna array is fed.

29. Method according to Claim 28, **characterized in that** two phase shifter output signals (PS_{out1}, PS_{out2}) are in each case tapped off at the two outputs of a phase shifter adjusting device (21), and in that the four signals which are produced in this way are supplied to the four inputs (A, B, C, D) of a Butler matrix (119).

30. Method according to one of Claims 23 to 28, **characterized in that** a double phase shifter arrangement (121) is used, at whose four outputs four output signals can be produced which are supplied to the four inputs (A, B, C, D) of a Butler matrix (119).